SECTION 02721
STORM SEWERS

PART 1 - GENERAL

1.1 SUMMARY

A. The work covered by this section shall consist of excavating and backfilling the trench and of furnishing, laying, and jointing HDPE, and corrugated metal culvert pipe and fittings. It doesn't include the construction of manholes, inlets, outlets, and other structures incidental to the construction of storm sewers or drains, all of which are covered elsewhere in these specifications. Excavation for storm sewers or drains shall comply with all applicable provisions of.

1.2 RELATED SECTIONS

A. General and Supplemental Conditions

B. Section 02222 - Excavation for Utilities

1.3 SUBMITTALS

A. Submit shop drawings and test certifications for pipe for all products specified in this section in accordance with the requirements of General and Supplementary Conditions.

PART 2 - PRODUCTS

2.1 GENERAL

A. The diameter of pipe culverts and storm drains shown on the project drawings and bid schedule are based on Manning's formula for pipe flowing full, at the slopes shown on the drawings and profiles.

2.2 HDPE AND CORRUGATED METAL CULVERT PIPE

A. High density polyethylene pipe (HDPE) (4 inches to 48 inches) with a smooth interior shall be Type S, SP or D in accordance with AASHTO M 252, AASHTO M 294, and AASHTO MP6. All HDPE pipe fittings and couplings shall be in accordance with AASHTO M 252, AASHTO M 294, and AASHTO MP6.

B. All pipe and specialty items shall be inspected and accepted by an approved commercial testing laboratory prior to delivery to the work site. Each joint and each special shall be stenciled or otherwise marked with the laboratory's mark of acceptance. Furnish the Construction Manager (CM) with two certified copies of the laboratory's report of inspection, test, and acceptance on all pipe and specials prior to its incorporation in the work.

C. Corrugated metal culvert pipe shall conform to the requirements of AASHTO M36 specifications for corrugated metal culvert pipe. The gauges for various sizes of pipe shall be as follows unless otherwise noted on the plans:

DIAMETER	GAUGES (2-3/4 INCH x 1/2 INCH CORRUGATION)
15 inches	16
18 inches	16
24 inches	16
30 inches	14

DIAMETER	GAUGES (2-3/4 INCH x 1/2 INCH CORRUGATION)
36 inches	14
42 inches	12
48 inches	12
54 inches	12
60 inches	12
66 inches	12
17 inch x 13 inch pipe arch	14
21 inch x 15 inch pipe arch	14
28 inch x 20 inch pipe arch	14
35 inch x 24 inch pipe arch	14
42 inch x 29 inch pipe arch	14
49 inch x 33 inch pipe arch	12
57 inch x 38 inch pipe arch	12

D. The Subcontractor shall require that his supplier furnish a certification that all materials furnished meet the above standards and specifications.

E. Furnish pipe in the sizes shown on the drawings. All pipe and specials shall be of new materials not previously used.

2.3 JOINT MATERIALS

A. Joints for HDPE pipe shall meet the requirements of ASTM D 3212 at 10.8 psi. Use the Advanced Design Systems, Inc. (ADS) N-12 ProLink WT or CM approved equal. All joints will be fitted with a rubber O-ring gasket meeting the requirements of ASTM F 477.

B. Joints for CMP pipe shall be of sufficient strength to maintain the pipe configuration through the joint. All joints shall have an o-ring or sleeve gasket of sufficient quality to maintain a water-tight seal. Coupling and gasket configuration will be approved by CM.

2.4 DUCTILE IRON PIPE AND FITTINGS

A. Ductile cast iron pipe shall be centrifugally cast of iron that meets the requirements for modular iron castings of ASTM E8, plain end with push-on, single gasket joints. The design thickness shall be that specified by ANSI A21.50/AWWA C151, latest revision, with a wall thickness of Pressure Class 350.

B. Pipe shall be tested in accordance with ASTM A339. The pipe manufacturer is to furnish the CM a certificate of compliance, signed to by the factory inspector, stating that the pieces of pipe in the shipment conform to ANSI A21. Each certificate shall list the serial number of each piece of pipe making up the shipment.

C. The push-on, single gasket joints shall be either Fastite (manufactured by American Cast Iron Pipe Company), Tyton (U.S. Pipe and Foundry Company), Super Bell-Tite (Clow Corporation), or other joints of similar type and equal quality.

D. The bell of each pipe shall have a tapered annular opening and a cast or machined retaining groove for the gasket. The plain spigot end of the pipe shall be beveled.

E. The gasket shall be of high quality vulcanized rubber made in the form of a solid ring to exact dimensions. The design of the gasket groove in the bell of the pipe and the design, hardness, and other properties of the gasket itself shall be such that the joint is liquid tight for all pressures from a

vacuum to a maximum rating of 350 psi of internal liquid pressure.

F. Enough lubricant shall be furnished with each order to provide a thin coat on the spigot end of each pipe. This lubricant shall be nontoxic, impart no taste or smell to the water, and have no harmful effect on the rubber gasket. It shall have a consistency that will allow it to be easily applied to the pipe in either hot or cold weather and that will enable it to adhere to either wet or dry pipe.

G. Fittings shall be ductile iron. Use standard mechanical joint fittings. All fittings shall conform to the specifications of ANSI A21.10/AWWA C110, standard body.

H. Pipe and fittings shall be lined with a thin cement lining as specified in ANSI A21.4/AWWA C104. In addition, a bituminous seal coat or asphalt emulsion spray coat approximately one mil thick shall be applied to the cement lining in accordance with the pipe manufacturer's standard practices. A petroleum asphaltic coating approximately one mil thick shall be applied to the outside of the pipe.

I. Fittings shall be in accordance with the standard mechanical joint fittings manufactured by the U.S. Pipe and Foundry Company, American Cast Iron Pipe Company, Clow Corporation, Griffin, McWane, or equal.

PART 3 - EXECUTION

3.1 PIPELINE CONSTRUCTION

A. Before constructing or placing joints, demonstrate to the CM, by completing at least one sample joint, that the methods employed conform to the specifications, will provide a watertight joint, and further that the workmen intended for use on this phase of the work are thoroughly familiar and experienced with the type of joint proposed.

B. Before placing storm sewer pipe in position in the trench, carefully prepare the bottom and sides of the trench, and install any necessary bracing and sheeting. Pipe bedding shall be placed in the trench as per the construction Drawings.

C. Tightly stretch a mason's line or wire above the ground level, parallel to and directly above the axis of the pipe to be installed; this line is to be supported at intervals of no more than 50 feet on sewers being laid on a grade of two percent or more and not exceeding 25 feet for grades of less than two percent. Determine the exact line and grade for each section of pipe by measuring down from this line to the invert of the pipe in place. Accurately place each pipe to the exact line and grade called for on the drawings. Furnish all labor and materials necessary for erecting batterboards. The use of laser beams will be allowed.

D. Do not allow water to run or stand in the trench while pipe laying is in progress, before the joint has completely set, or before the trench has been backfilled. Do not at any time open up more trench than the available pumping facilities are able to dewater.

E. Correct trench bottoms found to be unsuitable for foundations after pipe laying operations have been started, and bring them to exact line and grade with compacted earth as necessary.

F. Carefully inspect each piece of pipe and special fitting before it is placed, and lay no defective pipe in the trench. Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the bells upgrade.

G. Jointing operations shall follow pipe laying very closely; failure to comply with this provision will result in the CM's stopping all pipe laying operations until jointing operations catch up.

3.2 JOINT CONSTRUCTION

A. Joints for HDPE pipe shall be constructed in strict accordance with the manufacturers requirements. Lines shall be laid out for the minimum number of joints.

B. Joints for CMP pipe will be approved by the CM prior to pipe fabrication. The o-rings or sleeve gaskets shall meet the requirements of ASTM C443. Adequately lubricate with cement provided for this purpose.

C. All pipe joints shall be adequately and thoroughly driven home in order to ensure proper performance.

3.3 EXISTING UTILITIES

A. Carefully protect all existing utilities, electric lines, or other utilities or structures in the vicinity of the work from damage at all times. Wherever it is necessary for the proper accomplishment of the work to repair, remove, and/or replace any utility or structure, do so in accordance with directions from the CM.

3.4 CLEAN-UP

A. After completing each section of storm sewer line, remove all debris and construction materials and equipment from the site of the work, grade and smooth as directed by CM.

END OF SECTION 02721